

CLAIMS

WHAT IS CLAIMED:

1. A method of forming an insulating layer, the method comprising:
5 forming a dielectric layer with an initial thickness on an oxidizable substrate; introducing nitrogen into said dielectric layer; and locally increasing said initial thickness of said dielectric layer according to a local nitrogen concentration.

10 2. The method of claim 1, wherein said initial thickness is locally increased by oxidizing said substrate.

15 3. The method of claim 1, wherein said dielectric oxide layer comprises silicon dioxide and the initial thickness is in the range of approximately 0.5-5 nm.

4. The method of claim 1, further comprising determining a ratio of said initial thickness and a maximum local increase to control a specific characteristic of said insulating layer.

20 5. The method of claim 4, wherein said ratio is determined as a target value in advance.

25 6. The method of claim 4, wherein said ratio is achieved by controlling at least one of said initial thickness, a process parameter while locally increasing said initial thickness, and a process parameter while introducing said nitrogen.

7. The method of claim 1, wherein said dielectric layer is formed by at least one of thermal growth, rapid thermal oxidation, chemical vapor deposition, atomic layer deposition and chemical reaction.

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8. The method of claim 1, further comprising patterning said insulating layer as a plurality of gate insulation layers for PMOS transistors at different locations on said substrate.

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9. The method of claim 1, wherein said nitrogen is introduced into said insulating layer by exposing said substrate to a nitrous plasma.

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10. A method, comprising:

forming a silicon dioxide layer as a base layer for a gate dielectric with an initial thickness on a first area and a second area of a silicon containing semiconductor layer provided on a substrate;

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introducing nitrogen into said silicon dioxide layer; and

increasing said initial thickness in said first and second areas on the basis of a nitrogen concentration contained therein and a desired characteristic of said gate dielectric.

11. The method of claim 10, wherein increasing said initial thickness includes oxidizing said substrate.

12. The method of claim 11, wherein oxidizing said substrate is performed after introducing nitrogen into said silicon dioxide layer.

5 13. The method of claim 11, wherein oxidizing said substrate is performed at least partially simultaneously with introducing nitrogen into said silicon dioxide layer.

14. The method of claim 10, further comprising determining a ratio of said initial thickness and a maximum thickness increase in one of said first and second areas to control a specific characteristic of said gate dielectric.

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15. The method of claim 14, wherein said ratio is determined as a target value in advance.

15 16. The method of claim 15, wherein said ratio is achieved by controlling at least one of said initial thickness, a process parameter while locally increasing said initial thickness, and a process parameter while introducing said nitrogen.

20 17. The method of claim 10, wherein said silicon dioxide layer is formed by at least one of thermal growth, rapid thermal oxidation, chemical vapor deposition, atomic layer deposition and chemical reaction.

25 18. The method of claim 10, further comprising patterning said gate dielectric as a plurality of gate insulation layers for PMOS transistors at different locations on said substrate.

19. The method of claim 10, wherein said nitrogen is introduced into the base layer by exposing said substrate to a nitrous plasma.